



MODLAND VALIDATION



- **MODLAND VALIDATION METHODS**
 - **Radiative Transfer Models**
 - » compare satellite data to modelled output
 - » compare simple parameterizations to complex models
 - » BRDF - angular extrapolation and interpolation for V.I., normalized angles and albedo
 - **Field Correlation Measurements (Test Sites)**
 - » LAI, fAPAR and NPP - measured at test sites
 - » Surface Temperature & Emissivity - flat uniform sites, inland lakes
 - » BRDF/ Albedo tower measurements at representative sites
 - **Aircraft Data**
 - » Surface Reflectance, Vegetation Indices, BRDF, Snow and Land Cover, Fire - test algorithms and larger scale aggregation over heterogeneous/transect surfaces (MAS/ASAS/AVIRIS/POLDER)
 - » Test surface reflectance retrieval
 - » Surface Temperature - test day/night algorithm



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- **Existing Satellite Data (Pre-launch)**
 - » **Surface Reflectance, Vegetation Indices, BRDF, Snow and Land Cover, NPP, Fire - test algorithms and examine effects of satellite sampling geometries, surface heterogeneity and sparse temporal sampling (AVHRR, TM, GOES)**
- **Future Satellite Data**
 - » **SeaWifs, POLDER, SPOT VEGETATION, GLI to investigate improved algorithms using more advanced sensors**
 - » **Intercomparison of EOS products (Landsat 7, MISR, ASTER)**



MODLAND VALIDATION



- **PRE-LAUNCH VALIDATION ACTIVITIES**
 - **Radiation Surface Parameters**
 - » **Surface reflectance, vegetation indices and BRDF/Albedo validation of reflectance retrieval using:**
 - complex BRDF models
 - field radiometric measurements (e.g., PARABOLA and others)
 - aircraft/satellite data for heterogeneity effects and robustness
 - Surface temperature using field spectroradiometric measurements
 - **Non-Radiation Surface Parameters**
 - » **NPP model intercomparison e.g. VEMAP , IGBP GAIM/PIK**
 - » **Surface Emissivity, LAI/ fAPAR, NPP - in-situ surface measurements from previous and planned intensive field campaigns (e.g. FIFE, BOREAS, LBA), distributed test sites (EOS Validation Test Site Program) and targets of opportunity**



MODLAND VALIDATION



– Image-based Parameters

- » **Thermal anomalies, snow/ice, and landcover - prototype detection and mapping algorithms with aircraft, satellite imagery and some field measurements**
- » **examine effects of satellite sampling times and resolution e.g. TM, AVHRR, DMSP, GOES**



MODLAND VALIDATION



- **MODLAND TEST SITE REQUIREMENTS**
 - **MODLAND will use the EOS Validation Test Site Hierarchy**
 - **with emphasis on 50-60 globally distributed sites, with minimum size of 3 km x 3 km, in a range of surface/atmosphere/illumination conditions**
 - **Measurement Types at Test Sites**
 - **P = once per year**
 - **I = infrequent (weekly, monthly and/or seasonally)**
 - **F = frequent (daily at overpass times)**
 - **Atmospheric correction:**
 - » **F - aerosol optical depth and properties**
 - » **F - water vapor**
 - » **F - ozone**
 - » **F - hemispherical and directional up(down)welling radiance in 7 bands**
 - » **F - cloud characterization**



MODLAND VALIDATION



- **Surface Parameters (radiometry/surface characteristics)**
 - » **P - topography, landscape parameters**
 - » **P - type/species composition (incl. understory)**
 - » **I - disturbance**
 - » **I - vegetation structure (LAI, LAD, biomass, % cover)**
 - » **I - phenology (greenup, peak standing biomass, senescence, leaf fall)**
 - » **I - vegetation, litter and soil optics and emissivity**
 - » **I - soil properties (incl. moisture)**
 - » **F - surface temperature**
 - » **F/I - radiometry: fAPAR, albedo, full spectral BRDF & BTDF of canopy, soil, and litter, thermal up/downwelling**
 - » **F - CO₂ and Water flux**
- **Meteorological/Boundary layer**
 - » **F vapor pressure deficit, air temperature, standard meteorological tower parameters**



MODLAND VALIDATION



- **Test Site Requirements cont'd**
 - **Proposed distributed test-site matrix:**
 - » **3 north polar region**
 - » **8 northern (boreal)**
 - » **6 North America**
 - » **6 western Europe**
 - » **6 eastern Europe**
 - » **18 Tropical belt**
 - » **15 southern hemisphere temperate**
 - » **3 south polar region**
 - **Build on existing site networks where possible e.g. LTER, IGBP Transects**
 - **Add heterogeneity and transitional sites for post-launch**
 - **Include IDS site measurement requirements as appropriate e.g., latent and sensible heat fluxes**



MODLAND VALIDATION



- **MODLAND INTENSIVE CAMPAIGNS and TEST SITES**
 - **MODLAND will participate in International Intensive Field Campaigns:**
 - » Opportunities for product string end-to-end testing
 - » Interaction with broader science community
 - » Science application of MODLAND products
 - **Previous and Planned Intensive Campaigns include :**
 - » FIFE, BOREAS, OTTER, HAPEX-Sahel, MONSOON'90, NOPEX, TRACE- SAFARI
 - » LBA, CARBON AMERICA, SALSA (planned)
 - **MODIS Campaigns (interdisciplinary)**
 - » SCAR- A/ B/ C
 - » Southern Africa 1999 (MODLAND - planned)
 - » Other TBD



MODLAND VALIDATION



- **MODLAND Test Sites**
 - » **Test Site emphasis for MODLAND Validation**
 - » **Collaborative sites being developed with on-going monitoring programs e.g. LTER / GAP / GLCTS / ARM / AERONET / EURO-FLUX - close coordination with field scientists**
 - » **MODLAND working closely with international coordination activities e.g. IGBP transect sites, GTOS development**
 - » **MODLAND will integrate its site requirements with the EOS Validation Test Site Program - multi-instrument design.**
 - » **Need to ensure satellite acquisition strategy for EOS and non-EOS Sensors for the EOS test sites**
 - » **Need to ensure effective test site data system implementation**